DIRECT BACKLIGHT MODULE

This application claims the benefit of Taiwan application Serial No. 092123670, filed August 27, 2003, the subject matter of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The invention relates in general to a backlight module, and more particularly to a direct backlight module for a thin-film transistor liquid crystal display.

Description of the Related Art

[0002] Liquid crystal displays (LCDs) have been widely used as large displays such as screens of desktop computers and small displays such as portable information terminals because LCDs have the characteristics of thin shape, light weight, low power dissipation. However, a LCD is not a self-luminescent display so that a backlight module is required as the light sources.

[0003] FIG. 1 shows a conventional direct backlight module. Referring to FIG. 1, a direct backlight module 100 includes a reflective base 110, several lamp tubes 120 and a lamp-supporting frame 130. The lamp tubes 120 are

light sources of the direct backlight module 100 and light emitted from the lamp tubes 120 are reflected to a LCD display by the reflective base 110.

[0004] The lamp tubes 120 are disposed on the reflective base 110 via several buffer blocks 115 within the lamp-supporting frame 130. In another words, two ends of the lamp tubes 120 are mounted in the buffer blocks 115 separately, and the buffer blocks 115 are covered and enclosed by the lamp-supporting frame 130 so that the lamp tubes can be connected with the lamp-supporting frame 130. Then, the lamp-supporting frame 130 are installed in the reflective base 110 so that the lamp tubes 120 are further connected with the reflective base 110.

[0005] However, the buffer rubbers 115, as bad conductors of heat are covered and enclosed by the lamp-supporting frame 130, heat given off from two ends of the lamp tube 120 is kept and accumulated inside the buffer blocks 115. As a result, temperature of the whole direct backlight module 100 can be easily raised and luminance performance of the direct backlight module 100 is greatly influenced.

SUMMARY OF THE INVENTION

[0006] In view of the foregoing, it is an object of the present invention to provide an improved direct backlight module of which heat given off from two electrodes of a lamp tube is not accumulated inside a buffer block and is transmitted outside of the backlight module. As a result, luminance

performance of the direct backlight module is improved.

[0007] The invention achieves the above-identified objects by providing a direct backlight module including a reflective base, a buffer block, a lamp tube and a casing. Two opposite side regions of the reflective base both have two opposite openings located at two ends of each side region separately. The buffer block is disposed on the reflective base and positioned opposite to one of the openings. The lamp tube has two opposite electrodes at two ends of the lamp tube separately, and one of the electrodes is mounted in the buffer block. The casing covers the buffer block and there is an airflow channel formed by the combination of the inner chamber of the casing and the openings when the casing is installed in the reflective base.

[0008] Other objects, features, and advantages of the invention will become apparent from the following detailed description of the preferred but non-limiting embodiments. The following description is made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 (Prior Art) shows a conventional direct backlight module;

[0010] FIG. 2A shows portions of the direct backlight module according to a preferred embodiment of the invention;

[0011] FIG. 2B is a vertical perspective view showing the backlight module

prior to installing the casing according to FIG. 2A;

[0012] FIG. 3 is a vertical perspective view showing the backlight module installed in the casing according to FIG. 2A;

[0013] FIG. 4 shows that ends of lamp tubes are mounted in buffer blocks and the buffer blocks are covered by the casing;

[0014] FIG. 5 is a perspective view showing a frame covering the reflective base; and

[0015] FIG. 6 is a perspective view showing a heat-transmitting fin disposed on the buffer block.

DETAILED DESCRIPTION OF THE INVENTION

[0016] The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like components throughout.

[0017] FIG. 2A shows portions of the direct backlight module according to

a preferred embodiment of the invention, and FIG. 2B is a vertical perspective view showing the backlight module prior to installing the casing according to FIG. 2A. Referring to both FIG. 2A and FIG. 2B, a direct backlight module 200 includes a reflective base 210, several buffer blocks 215, several lamp tubes 220 and two casings 230a, 230b (shown in FIG. 3). The lamp tubes 220 are light sources of the direct backlight module 200 and light emitted from the lamp tubes 220 are reflected to a LCD display by the reflective base 210.

[0018] Two opposite side regions 235 of the reflective base 210 protrude from the reflective base 210. There are two opposite openings 240a, 240b disposed at two ends of each side region 235 separately. The buffer blocks 215 are disposed on the reflective base 210 and positioned opposite to one of the openings 240a, 240b. Each of the lamp tube 220 has two opposite electrodes 221a, 221b at two ends of the lamp tube 220 separately, and the electrodes 221a, 221b are mounted in the buffer block 215 separately.

[0019] FIG. 3 is a vertical perspective view showing the backlight module installed in the casing according to FIG. 2A. Referring to FIG. 3, the casings 230a, 230b are installed in the reflective base 210 and cover the buffer block 215. An airflow channel 250a is formed by the combination of the inner chamber of the casing 230a and the opening 240a. Also, an airflow channel 250b is formed by the combination of the inner chamber of the casing 230b and the opening 240b.

[0020] FIG. 4 shows that ends of lamp tubes are mounted in buffer blocks

and the buffer blocks are covered by the casing. As can be seen in FIG. 4, the buffer blocks 215 are disposed on the reflective base 210 and covered by the casing 230a. Referring to FIG. 2A, FIG. 3, and FIG. 4 together, the casings 230a, 230b are hollow; the airflow channels 250a, 250b penetrate the casings 230a, 230b, respectively. Therefore, heat given off from the two electrodes 221a, 221b of the lamp tube 220 is guided through the buffer blocks 215, the airflow channels 250a, 250b and is then transmitted out of the backlight module 200 without accumulating within the buffer block 215.

[0021] FIG. 5 is a perspective view showing a frame covering the reflective base. Further, the direct backlight module 200 preferably includes a frame 260 for covering the reflective base 210, and the frame 260 has a hole 265b opposite to the airflow channel 250b. Symmetrically, the frame 260 has another hole not shown in FIG. 5 and opposite to the airflow channel 250a. Moreover, there could be preferably a fan installed in the frame 260 so that air can be blew in/out through the airflow channels 250a, 250b.

[0022] The hole 265b of the frame 260 facilitates heat given off from the lamp tube 220 to be transmitted out of the backlight module 200, and cooler air from outsides is exchanged with the waste heat by automatically convection. As for the fan installed in the frame 260, it helps air to be blew in/out through the airflow channels 250a, 250b by forcibly convection.

[0023] Moreover, referring to FIG. 6, it is a perspective view showing a heat-transmitting fin disposed on the buffer block. A heat-transmitting fin 270

is preferably disposed on the buffer block 215 so that the heat given off from the two electrodes of the lamp tube 220 and accumulated inside the buffer block 215 is transmitted outside by the heat-transmitting fin 270. In addition, the preferred material of the buffer blocks 215 is rubber or a heat-transmitting rubber.

[0024] The direct backlight module according to the invention is provided to transmit the waste heat from the lamp tube into outside by hollow casings on the buffer blocks. The waste heat can be guided through the buffer blocks, the airflow channels, the holes of the frame, and is then transmitted out of the backlight module rather than being accumulated inside the buffer block. The direct backlight module of the present invention is apparently improved to overcome the former disadvantages. Moreover, the direct backlight module of the invention is more effective, and lower energy consuming than the conventional.

[0025] While the invention has been described by way of example and in terms of a preferred embodiment, it is to be understood that the invention is not limited thereto. On the contrary, it is intended to cover various modifications and similar arrangements and procedures, and the scope of the appended claims therefore should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements and procedures.